Geological Survey
of Canada

Current Research
2000-A19

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2000

Natural Resources Canada Ressources naturelles Canada

Catalogue No. M44-2000/A19E-IN
ISBN 0-660-18011-1

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New field studies of the Chapperon Group, Vernon southwest map area, British Columbia[1]

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Daughtry, K.L., Thompson, R.I., and Erdmer, P., 2000: New field studies of the Chapperon Group, Vernon southwest map area, British Columbia; Geological Survey of Canada, Current Research 2000-A19, 4 p. (online; http://www.nrcan.gc.ca/gsc/bookstore)

Abstract: The Chapperon Group comprises a succession of tightly folded metasedimentary and metavolcanic rocks exposed in a southerly-trending belt of five inliers between Westwold and Whiterocks Mountain in south-central British Columbia (NTS 82 L/4W and 82 L/5W). The Chapperon Group rocks are interfolded with rocks of the Upper Paleozoic Harper Ranch Group and are unconformably overlain by the Upper Triassic Nicola Group. The base of the group is unknown.

Previous workers have suggested correlations between the Chapperon Group and various units with either pericratonic or oceanic affinities.

A new field study was initiated in 1999 to investigate the Chapperon Group with respect to its age, provenance, internal stratigraphy, relationships with adjoining units, and possible correlations with established units in other areas.

Résumé : Le Groupe de Chapperon se compose d'une succession de roches métasédimentaires et de roches métavolcaniques déformées par des plis serrés qui affleurent dans cinq fenêtres réparties dans une bande de direction sud s'étendant de Westwold au mont Whiterocks, dans le centre sud de la Colombie-Britannique (SNRC 82 L/4W et 82 L/5W). Les roches du Groupe de Chapperon sont plissées solidairement avec celles du Groupe de Harper Ranch du Paléozoïque supérieur et sont recouvertes en discordance par le Groupe de Nicola du Trias supérieur. La base du groupe est inconnue.

Dans des travaux antérieurs, des corrélations ont été proposées entre les roches du Groupe de Chapperon et diverses unités ayant des affinités péricratoniques ou océaniques.

En 1999, on a entrepris une nouvelle étude sur le terrain du Groupe de Chapperon afin d'en déterminer l'âge, la provenance, la stratigraphie interne et les relations avec les unités adjacentes, ainsi que pour établir des corrélations avec des unités définies dans d'autres régions.

[1] Contribution to the Ancient Pacific Margin NATMAP Project

INTRODUCTION

As part of the Ancient Pacific Margin NATMAP Project, a new investigation of the Chapperon Group has been initiated in the southwest part of the Vernon map area. The following is a summary of previous work, a description of relevant problems, and a preliminary report on the initial field mapping carried out in 1999.

The Chapperon Group is a succession of Paleozoic, variably metamorphosed and deformed sedimentary and volcanic rocks thought to have originated in a continental margin or back-arc basin, which occupies an arcuate belt extending for 50 km southerly from Westwold to the western slopes of Whiterocks Mountain (Fig. 1). The belt flanks the western margin of the Okanagan Batholith and is overlain on the west by sedimentary rocks of the Upper Triassic Nicola Group.

The Chapperon belt is buried in places beneath Eocene volcanic and sedimentary units, resulting in a string of five inliers of exposed Chapperon Group rocks separated by younger cover. From north to south, the inliers are in the Westwold, Salmon River Canyon, Chapperon Creek, Beak Creek, and Dome Rock Mountain areas.

Published maps (Read and Okulitch, 1977; Okulitch, 1979) show that units of the Upper Paleozoic Harper Ranch Group are interfolded with Chapperon rocks in the southern two thirds of the belt. From the head of the Salmon River Canyon to west of Dome Rock Mountain, Harper Ranch rocks overlie the Chapperon rocks on the west, and are overlain in turn by Nicola Group rocks. Along the strike of the belt to the southeast, in the area covered by NTS map sheet 82 E, the Chapperon Group is overlain by Harper Ranch Group rocks containing Permian fossils at Whiterocks Mountain, and Upper Triassic fossils near Okanagan Lake. The map patterns and progressive younging of units toward the southeast suggest that the Chapperon/Harper Ranch succession is folded in a southeast-plunging syncline.

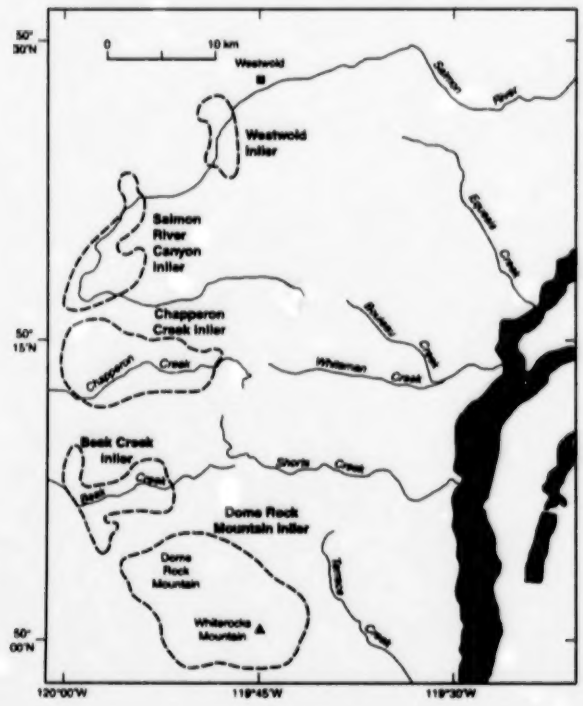

Figure 1. *Distribution of inliers of the Chapperon Group, Vernon southwest map area, British Columbia.*

PREVIOUS WORK

The Chapperon Group was defined by Jones (1959) as "a mixed assemblage of sedimentary and volcanic rocks that closely resemble those of the Eagle Bay Formation (Mount Ida Group) in lithology, general mutual association, and metamorphism." He stated that the Archean or later Chapperon Group was unconformably overlain by Upper Paleozoic Cache Creek Formation rocks at Salmon River Canyon and Dome Rock Mountain, and that "The base of the Chapperon Group was not identified."

Dawson (1898) assigned rocks now included in the Chapperon Group to two units: less-metamorphosed rocks were mapped as the lower members of the Carboniferous Cache Creek Formation, while higher grade rocks near Chapperon Creek were assigned to the Archean Shuswap Series.

Rice and Jones (1948) mapped the Chapperon rocks as Proterozoic or Paleozoic Mount Ida Group, similar to the Eagle Bay Formation.

Okulitch (1979) assigned a Mississippian or older age to the Chapperon Group, and correlated it with the Carboniferous or older Kobau Group in the southern Okanagan region. He also assigned some of Jones' Chapperon Group rocks to the Carboniferous–Permian Thompson assemblage (now Harper Ranch Group) and pointed out that the two groups are interfolded. Furthermore, they are separated by a Permian basal Thompson assemblage conglomerate at the Dome Rock Mountain unconformity.

There is a consensus among previous workers on several aspects of Chapperon geology: 1) The base of the group is not known; 2) Chapperon Group rocks are variably metamorphosed, with regional metamorphism having produced a range of rock types from phyllite to gneiss, and contact metamorphism having overprinted the products of earlier metamorphism near some plutons; and 3) Chapperon Group rocks are similar to those of the Kobau Group and the Mount Ida Group, particularly the Eagle Bay Formation. Other possible correlatives are the Silver Creek and Adams Lake (Tsalkom) formations in the Mount Ida Group (Thompson and Daughtry, 1998).

UNCONFORMITIES

Jones (1959) described two key areas, the Salmon River Canyon and Dome Rock Mountain, where the Chapperon Group is overlain with angular unconformity by the Cache Creek

Group (Harper Ranch Group). Preto (1964) studied the Salmon River unconformity in detail and concluded that the overlying rocks belong to either the Cache Creek or the Nicola groups.

At Salmon River Canyon (Fig. 1), the overlying sedimentary units are now known to belong to the Nicola Group. The angular unconformity is pronounced and the Chapperon rocks have suffered metamorphism and deformation prior to the deposition of the Nicola Group rocks. Read and Okulitch published a detailed map of the locality in 1977 (Read and Okulitch, 1977).

At Dome Rock Mountain (Fig. 1), stratigraphic relationships at the unconformity are equivocal. Jones (1959) considered the setting to be correlative with Salmon River, with the Chapperon strata overlain with angular unconformity by the same Upper Paleozoic units. Read and Okulitch (1977) disagreed, pointing out that the most recent fossil evidence shows the overlying units to be Permian at Dome Rock Mountain and Triassic at Salmon River. They also emphasize the difference in lithology and metamorphism of the overlying rocks at the two locales. The unconformity is subparallel or parallel to bedding in the Chapperon Group rocks. The basal unit above the unconformity is a fossiliferous Permian conglomerate, overlain by argillite, greenstone, phyllite, and marble typical of the Thompson assemblage (Harper Ranch Group). Both the unconformity and the conglomerate may be intraformational within an otherwise continuous Chapperon–Harper Ranch succession.

STRATIGRAPHY

Although containing a broad spectrum of rock types, the Chapperon Group has never been broken down into constituent formations. This was due to the complex structures, a paucity of natural bedrock exposures, and poor access at the time that the previous work was done. However, in recent years, parts of the area have been opened up with a pervasive network of new logging roads which provide both access and fresh bedrock exposures. This should allow the current study to gather new evidence toward resolving the internal stratigraphy of the Chapperon Group.

LITHOLOGY

In previous studies, different workers have described Chapperon Group rock types with differing emphasis.

Dawson (1898) wrote of two units: a sequence of argillite, quartzite, cherty quartzite, limestone, and mafic volcanic rocks, all of which are schistose in places; and a more highly metamorphosed sequence of mica schist, hornblende schist, crystalline limestone, and quartzite. Dawson's descriptions of the units indicate that the metamorphic grades are lower greenschist in the first unit, and greenschist to amphibolite in the second. Much of the argillaceous part of the package can now be assigned to the Nicola Group.

Jones (1959) defined the Chapperon Group as an assemblage of predominantly argillaceous rocks (locally quartzitic) and calcareous quartzite, limestone, and significant amounts of greenstone and chlorite schist. In places, these rocks have been metamorphosed to higher grade: phyllite, argillite, and quartzite have been transformed to biotite±muscovite±garnet schist and gneiss, and chlorite schist to hornblende gneiss and schist. Again, this suggests that a twofold subdivision of Chapperon Group rocks into lower grade and higher grade units may be possible.

Okulitch (1979) lists the Chapperon rock types as chlorite phyllite, greenstone, and micaceous schist with minor limestone and ultramafic rocks.

This study will attempt to distinguish between Chapperon and Harper Ranch lithologies, to resolve the internal stratigraphy of these poorly defined groups, and to resolve the distribution of rocks of differing metamorphic grades within the two groups.

Old Dave intrusions

The Chapperon Group is intruded by an almost diagnostic suite of serpentinized (?)alpine ultramafic plugs and dykes. These intrusions are not known in the Nicola Group, suggesting a pre-Upper Triassic age. Similar ultramafic bodies are known to intrude the Tsalkom Formation, Spa Creek assemblage, and Eagle Bay Formation, and their metamorphosed equivalents east of the Okanagan Valley.

OBJECTIVES OF THIS STUDY

The field study of the Chapperon Group begun in 1999 addresses the following issues: 1) The extent of the group (availability of detailed topographic base maps and the networks of new logging roads permit more detailed mapping than was possible when previous surveys were conducted); consequently, the extent of the group is proving to be significantly different from that shown on existing maps; as well, some rocks previously correlated with the Harper Ranch Group can now be assigned to the Nicola or Chapperon groups; 2) internal stratigraphy, structure, and metamorphic facies of the group; 3) nature of the base of the group; 4) relationships between the group and overlying younger units; 5) age of the group; 6) provenance of Chapperon Group clastic sediments, and 7) possible correlations with established stratigraphic units in other areas.

RESULTS OF 1999 FIELDWORK

In the Salmon River Canyon area (Fig. 1), the Chapperon Group comprises tightly folded interbedded metasedimentary and metavolcanic rocks intruded by rare small serpentinized ultramafic bodies. Metasedimentary rock types include quartzite, chert, quartzitic metasiltstone, argillite, siliceous argillite and phyllite, biotite phyllite and schist, minor grit and, near some plutonic contacts, hornfels. All

rock types are locally calcareous. Metavolcanic units are mainly chlorite phyllite and schist, which appear to be altered andesite tuff and flows.

The various rock types are intimately interlayered with individual strata ranging from a few centimetres to a few metres in thickness. This interbedding commonly results in the occurrence of several distinct rock types within a single small outcrop. Where the layers are thin, between 1 and 3 cm, the rocks develop a striped appearance which is characteristic of the Chapperon Group.

All units are tightly folded. Small folds with amplitude and wavelength ranging from a few centimetres to over a metre are ubiquitous. However, poor exposure has so far prevented the recognition of any large-scale folds. In general, bedding and compositional layering strike between north and east, with steep dips of 50 to 90° to either southeast or northwest.

In the Salmon River Canyon area, the Chapperon Group is overlain to the west by metasedimentary or unmetamorphosed rocks of the Nicola Group. The Nicola rocks are predominantly calcareous clastic sedimentary rocks which are distinctly lower grade compared to the Chapperon Group rocks. Rock types include calcareous siltstone, sandstone, slate, shale and grit, limestone, polymictic conglomerate, and noncalcareous siltstone and argillite.

As Preto reported in 1964, these rocks rest with angular unconformity on the Chapperon Group, and the grits and conglomerates contain abundant subangular to rounded clasts of the underlying Chapperon Group rock types. The Nicola rocks generally strike north-northeasterly and dip between 20 and 40° to the west. The Chapperon–Nicola unconformity strikes north-northeasterly through the Salmon River Canyon area and can be followed for more than 13 km.

To the east, the Chapperon Group is unconformably overlain by gently-dipping mafic flows, breccia, and volcaniclastic sediments of the Eocene Kamloops Group. These rocks were deposited on a surface with considerable topographic relief, and, in places, the Eocene flows and sedimentary strata terminate abruptly against a steep valley wall of Chapperon Group rocks that may represent the edge of the original Eocene depositional basin.

In the Salmon River Canyon inlier, 1999 mapping at 1:20 000 scale encountered typical Chapperon Group rock types in areas variously shown on published small-scale regional maps as being underlain by rocks of the Kamloops, Nicola, or Harper Ranch groups (Jones, 1959; Okulitch, 1979). Detailed mapping will be required to determine the distribution of the various units.

DISCUSSION

The initial reconnaissance of the geology of the Chapperon Group carried out in 1999 indicates that the distribution, constituent rock types, and relationships of the group with the adjoining Paleozoic, Triassic, and Eocene units differs, in places, from the regional interpretations shown on published small-scale mapping.

We anticipate that detailed field investigations in the 2000 season will resolve at least some of the many questions relating to Chapperon Group geology.

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Geological Survey of Canada Project 990002